October 4, 2024

Church Mutual Insurance Company
c/o Mark Kressenberg
Thompson Coe
4400 Post Oak Parkway, Suite 1000
Houston, TX 77027

METAL ROOFING: HAIL DAMAGE
CLEBURNE TRAINING AND FITNESS CENTER
1014-A NORTH NOLAN RIVER ROAD; CLEBURNE, TX 76033

BACKGROUND

This firm was contacted and retained in August of 2024 by Mr. Mark Kressenberg of Thompson Coe with respect to the roof of subject property to opine concerning the extent of damage from a recent hail event or events. We were asked to assess whether or not the damage constitutes "functional" damage or "cosmetic" damage. This firm was specifically asked to review expert reports and documents pertaining to a claim for functional damage due to a hailstorm on March 16, 2023 and render our opinions with respect thereto.

Our assumptions due to hail damage are that cosmetic loss or damage means only that damage that alters the physical appearance of the roof covering but does not result in damage that allows the penetration of water through the roof covering nor does it result in the failure of the roof covering to perform its primary intended function to keep out weather elements over an extended period of time.

Functional damage, on the other hand, is hail damage to roof coverings that results in damage that will allow the penetration of water through the roof covering or that results in the failure of the roof covering to perform its intended function, to keep out elements over an extended period of time.

Our opinions in this regard are based principally upon the assessment of reports, photography and evaluations of other experts that Ron Dutton has carefully reviewed and Rob Haddock's review of relevant expert reports and photography, general knowledge and experience with similar hail claims and/or damage to metal roofing, and more specifically 55%Al-Zn unpainted (Galvalume®) alloy-coated steel standing seam of 24 gauge. The natural aging (corrosion behavior) of this material over decades of time is central to this case.

Thompson Coe is legal counsel representing Church Mutual Insurance Company. They have provided us with the following Expert Reports and information:

1. HailTrace Forensic Weather Report (15276082.1), authored by John Choquette and prepared for SJB Law Firm, dated 7-8-2024.
2. Forensic Weather Consultants Report (15565236.1), authored by Dillon Turner and prepared for Church Mutual, dated 7-27-2023.
3. Forensic Weather Consultants Supplemental Report (15565698.1), authored by Dillon Turner and prepared for Thompson Coe, dated 8-9-2024.

4. Spradling Engineering Assessment Report (15276078.1), authored by Donald J. Spradling and prepared for building owner Mark Simmerman, dated 7-5-2023.
5. Element Laboratory Report (15276079.1), authored by Jeffrey Molnar and prepared for SJB Law Firm, dated 6-28-2024.
6. Jobsite photos recorded 9-17-24 and received from Thompson Coe 9-24-24.

It is our understanding that several buildings are on the property, one or more constructed in 1985, and several others constructed in 1990.

DISCUSSION ABOUT THE COATED STEEL PRODUCT USED ON THESE BUILDINGS: GALVALUME® COATED STEEL[1]

Galvalume® is a registered trademark for a proprietary alloy coating used for corrosion protection over carbon steel sheet. The coating was developed by Bethlehem Steel Corporation in the late 1960's. It became commercially available in 1972 and has since been licensed worldwide by BIEC (Bethlehem International Engineering Corporation), the owner of the trademark. The ASTM specification is A792, Sheet Steel, Aluminum-Zinc Coated. Generically, the descriptor is "55% Al-Zn" as the aluminum portion is 55% of the alloy by weight. The zinc portion is about 43.4%, and the remainder is silicon additive. Note that these alloy proportions are weight-based as is typical to the metals industry. Due to the much lower density of aluminum, the coating actually contains approximately 80% aluminum by volume.

The coating is applied to the carbon steel substrate (in coil format) by the "continuous hot-dip method" in a molten metal bath at about 1100º F, resulting in an intermetallic alloy layer which functions as a metallurgical bond between base steel and coating. It is normally produced with coating application rates of 0.55oz/ft^2 that result in a thickness of nominally 0.00088" (0.88 mils) on each side (minimum of 40% of the total on one side in accordance with referenced ASTM specification). There are currently approximately 40 producing licensees of this coating technology globally, and trade names vary. Other examples are Zincalume®, Zintroalume® and Aluzinc®. U.S. domestic producers all use the trade name "Galvalume". An Australian producer who is often imported to the U.S. market utilizes the trade name Zincalume®.

Within about 20 years of its introduction this alloy-coated sheet steel virtually swept the market for coated steel sheet used in unpainted (or "bare") applications due to its superior corrosion performance. The subject litigation is such an application. The market of reference is that of coated steel for exterior cladding applications and more specifically roofing sheets. This market was previously dominated by "galvanized" steel, which is a commercially pure (99.95%) zinc coating in G-90 designation (ASTM A653).

The advantages of 55% Al-Zn alloy-coated steel are that while it retains the sacrificial zinc and zinc oxide components for protection and "self-healing" characteristics at scratches and cut edges (where

[1] For more on the history of Galvalume® see Galvalume® The BIEC Journey; Copyright 2008, BIEC International Inc.

the base steel can become exposed), at the same time it introduces the aluminum and aluminum oxide components for corrosion protection. Aluminum forms an oxide layer quickly when exposed to air and moisture that is much more durable than zinc oxide. These components are more inert in behavior and together the synergism for corrosion protection results in coating durability significantly superior to galvanized material and resulting in service life several times that of galvanized steel.[2]

To further explain, the corrosion performance of the Galvalume product is also related to the unique microstructure of the alloy coating. The structure consists of an overlay and the aforementioned intermetallic alloy layer that metallurgically bonds the coating to the steel substrate. The overlay contains cored aluminum-rich dendrites and zinc-rich interdendritic areas interspersed with occasional silicon particles. When exposed to the atmosphere, the circuitous, zinc-rich areas are attacked first and soon fill up with corrosion products that retard subsequent corrosion.[3] So notably (and especially in bare, unpainted applications), cut edge, scratch, and micro-fracture protection are due to the unique behavior of this coating microstructure.

Because this coating is applied to the steel sheet in flat coil format, it must be able to withstand the trauma of panel fabrication processes that deform the sheet into its finished profile shape. It must also be able to withstand the trauma of shipping and handling including installation foot-trafficking and resulting scratches and abrasions in addition to the trauma of field folding the seams into a tightly formed "double fold" without impugning the integrity of the coating. These fabrication and field-forming processes involve machinery and equipment that bend, form, and fold the sheet material to various degrees of deformation severity using hardened steel or stainless-steel dies and within the forming equipment. Although the raw material producers' warranties normally limit bend radii to 2T (double the material thickness) we have witnessed 35- and 40-year-aged behavior of much tighter bend radii inclusive of micro-fractures and surface abrasions caused by machine seam joining with no adverse corrosive effects. The radius bends and deformation caused by hail impact are much less severe and are generally between 15T and 40T depending upon how they are measured.

Empirical data are unavailable as the oldest roofs of this material are only now exceeding 40 years and have not reached end-of-life except in extremely corrosive environments. In any event, this would be germane concerning hail damage only if in fact the subject property were located in such an extremely corrosive environment, which it is not. We have never seen such phenomena resulting from even the severest hail events. Such likelihood is further diminished as slopes increase from the minimum of ¼:12 (2% slope or ~1.2º).

As with all materials exposed to the elements, 55% Al-Zn alloy coatings "weather" over time. This results in a loss of gloss as the oxide layers build up and tarnish. The coating also tends to gather dirt particles over time. Under some magnification, these particles are dark in color, but not to be confused with corrosion. They can generally be removed with spittle and finger or light sponge cleaning with a mild soapy solution so that the real metallic coating condition can be observed by the naked eye or with some slight degree of magnification.

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[2] For more information, see *Metal Roofing from A (Aluminum) to Z (Zinc), Chapter 2, Metallic Coatings for Carbon Steel*; copyrights and publications multiple by author, Rob Haddock; latest edition, Metal Construction Association; http://www.metalconstruction.org/Tech-Resources

[3] L. Allegra, R.J. Dutton and A. Humayun, "Galvalume Sheet - New Technical Developments", *14th International Conference on Hot-Dip Galvanizing,* Munich, June 9-14, 1985.

The degree of dirt collection will be exaggerated in an aged hail divot and can be used by a trained eye to approximate the age of the hail event. Although this is not an exact science, it can be useful and indicative (if only approximate) in many cases. Hail "spatter" generally removes some of the dirt from the coating producing the same visual effect of cleaning the aged surface of the coating. While this "cleaning" is often perceived by less-informed observers to be "damage", it is not. It is merely cleaning.

THE HAILTRACE REPORT (OUR COMMENTS IN ***BOLD ITALICS***)

The HailTrace Report, dated 7-8-2024, was prepared for the SJB law firm. This report presents data from the NOAA Storm Events Database which show hail ranging in diameter from 1.50-2.00" falling in the area surrounding the subject buildings on March 16, 2023 (p.11). The data are presented on a Google Earth map (p. 16) of the HailTrace report. ***It is noted that the Cleburne Municipal Airport is only 0.56 miles from the subject property and services corporate jet, helicopter and general aviation aircraft. This is not incidental as will be discussed later under the Element Report. The author used additional radar data analysis on page 27 to conclude that hail up to 2.50 inches in diameter fell at the subject property although hail of only up to 2.00" in diameter was reported at the airport by a "trained spotter" as recorded in the NOAA Storm Events Database shown on page 13 of the HailTrace Report.***

THE FORENSIC WEATHER CONSULTANTS REPORT (OUR COMMENTS IN ***BOLD ITALICS***)

The Forensic Weather Consultants Report, dated 7-27-2023, was prepared for Church Mutual and presents data that identify hailstorms within a 10-mile radius of the subject property between 1-1-2013 and 6-23-2023. Five prior hail events were identified (p. 11-12) with hail diameters ranging from 0.5-1.75". The hail event on March 16, 2023 produced hail from 1.75 and 2.00". ***We have no comment here other than to note the difference in maximum hail diameters reported in this report compared to that reported in the HailTrace Report.***

THE FORENSIC WEATHER CONSULTANTS SUPPLEMENTAL REPORT (OUR COMMENTS IN ***BOLD ITALICS***)

This supplemental report, dated 8-9-2024, was prepared for Thompson Coe and evaluates the HailTrace Report's claim of hail diameters up to 2.50", questioning the methodology used for such a conclusion. ***We have no comment here other than to note there are differences in the methodologies used to arrive at the maximum hail size that occurred near the subject property on March 16, 2023.***

THE SPRADLING REPORT (OUR COMMENTS IN ***BOLD ITALICS***)

The Spradling Engineering Assessment Report, dated 7-5-2023, was prepared for the building owner, Mark Simmerman, and reported the results of their non-destructive observations of the subject property (p. 6). The roofing panels are described as 24-gauge, Galvalume raised-rib panels and Kynar-coated raised-rib panels. The metallic coating under the Kynar-coated panels is not identified and could be Galvalume or galvanized. Spradling quotes the same NOAA Storm Events Database referenced in the HailTrace report showing 2.00" hail at the nearby airport, but also references a Core Logic report showing hail up to 2.4". ***In general, there are several photos showing the frequency of hail strikes on the different roof sections, but no attempt to discriminate between fresh hail strikes and aged ones which would likely be present from prior hailstorms of up to 1.50-1.75" as noted in the Forensic Weather Consultants Supplemental Report on pages 11-12.***

On page 8 of the Spradling report it is stated: "As a rough guideline, hailstones measuring 1 inch (2.5 centimeters) in diameter or larger are commonly considered capable of causing damage to a metal roof." ***This statement has no source reference and does not adequately define "damage".*** Also on page 8, potential damage to the panel seams is discussed but is not supported by evidence. They state: "Therefore, the hail occurring from the March 16, 2023 storm was more likely than not capable of causing damage to the seams of the raised rib steel panel roof system." ***This statement is speculative and not supported by evidence showing such "damage", or what kind of damage. It also claims that this speculation applies to the whole (metal) panel roof system.***

On page 9 of the Spradling report, it is stated, "Mr. Simmerman submitted multiple receipts for repair materials following the storm event for repairs required due to moisture intrusion." ***These receipts are not shown, so it is impossible to know what, indeed, was repaired or the specific nature of these repairs. We also did not see in this report any photographs of repaired areas associated with hail "damage" on the seams, or other areas. In fact, Figures 5, 7, and 9 show water intrusion has clearly been going on for a time period much longer than the approximate 16 weeks between the storm and the Spradling report, as evidenced by the much darker stains on some of the tile areas. In fact, the proximity of the supposedly recent leaks to the older leaks, as shown in Figure 9, implies that pre-existing leaks were still allowing leaks to occur from the same roof issues but exacerbated by storm winds. In other words, there is no demonstrated direct link between water stains on ceiling tiles and hail "damage" from the storm of March 16, 2023.***

On page 14 of the Spradling report, it is claimed that there were 1-4 hail hits on seam locations per square (100 sf) of the roof, followed by the statement that there were "approximately 35 hits on seam locations observed throughout the roof." ***These two statements seem to contradict each other: if the whole roof means the entire 34,536 square feet of roof, then there would be significantly more than 35 seam hits on the whole roof. Be that as it may, the degree of deformation on seam areas shown in Figures 16, 18, 28, and 29 (p.15 of the report) does not appear significant enough to warrant roof replacement, especially considering that a side seam would typically have butyl sealant tape installed to prevent such moisture intrusion. We have seen many hail dings on seam locations of***

through-fastened metal roofs and have not observed any weather-integrity issues. In addition, the Roofing Industry Committee on Weather Issues, Inc. (RICOWI) reported on the hail damage from a hailstorm in the Dallas/Fort Worth area in 2011 which supports our conclusions.[4] In that report, the authors state, "Most of the metal roof systems inspected had greater than maximum hailstone size of 2.5 inches in diameter, and no leakage was observed or reported even with the moderate to severe denting".

On page 23 of the Spradling report's conclusions, it is stated, "Hail-related research shows that hail in the size range produced from the storm event have been shown to cause damage to roofing systems similar to the ones found at the subject property." ***Once again, there is no source reference or definition given for the word "damage"***.

THE ELEMENT REPORT (OUR COMMENTS IN **BOLD ITALICS**)

The Element Materials Technology Laboratory Report, dated 6-28-2024, was prepared for the SJB law ~~firm and describes the foren~~sic investigation results of samples obtained from 5 roof panels. The report shows relatively low-magnification (~10-60X) stereo optical microscope images of roof panel No. 1, followed by higher magnification backscattered electron (BSE) images of two divots (1A and 1B) from that panel, along with energy dispersive X-ray spectroscopy (EDS) tables showing elemental compositions of the Galvalume surfaces in those two areas. ***It is worthy to note the visual differences between divots 1A and 1B as it relates to the apparent age of the divots. Figures 3 and 5 from the Element report are shown below in our Figure 1. The visual difference is striking and underscores the importance of accurately identifying which hail divots on the Cleburne roofs can be attributed to the March 16, 2023 hailstorm. In any case we see no examples of "functional damage".***

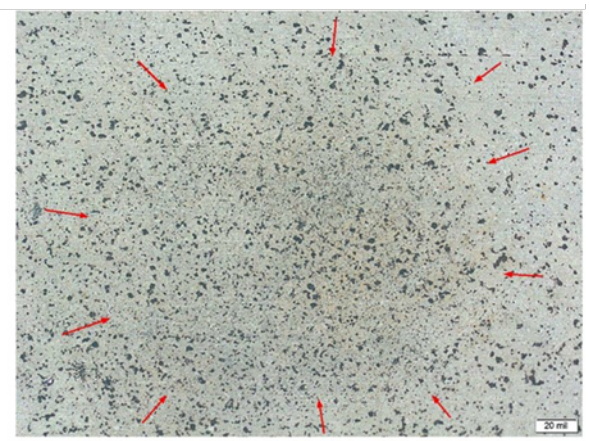

Figure 3: Stereo optical microscope image representative of the impact point of damage on roof panel No.1 impact point 1A (Figure 1). The scale bar is in mils (0.001").

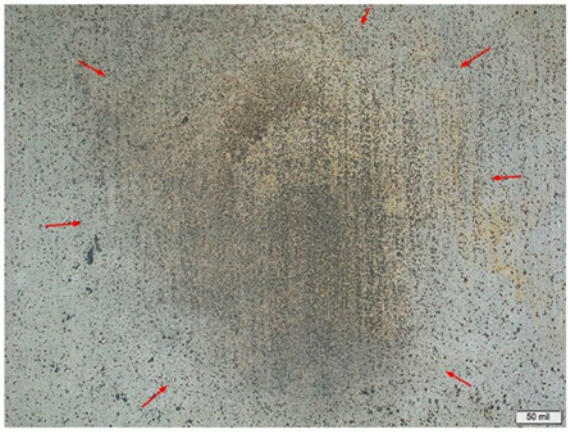

Figure 5: Stereo optical microscope image representative of the impact point of damage on roof panel No.1 impact point 1B (Figure 1). The scale bar is in mils (0.001").

Figure 1. Figures 3 and 5 from the Element report showing suspected age difference between a more recent divot (left) and an aged divot (right) located approximately 6 inches apart on roof panel No. 1.

4 RICOWI, "H*a*ilstorm Investig*a*tion Report – M*a*y 24, 2011- H*a*ilstorm D*all*a*s*/Fort Worth, TX", RICOWI, Inc., 2012.

Specific results and opinions are presented on pages 1-2 of the Element report and summarized as follows:

1) Hail impacts have caused "accelerated corrosion of the base metal".
2) Iron oxide corrosion products exist along microcracks and even "in areas where topcoat material remained".
3) There is a "migration of Fe from the base metal through the protective coating system" resulting in the "formation of very heavy agglomerates of iron oxide(s)".
4) Hail damage has resulted in "loss of corrosion protection".
5) Hail damage "has influenced the functionality of the roof" and "has influenced service life".

OUR COMMENTS REGARDING THE ABOVE OPINIONS FOLLOW IN ***BOLD ITALICS***:

1) Regarding opinions 1, 2, and 3, it is not credible to make these statements without more rigorous metallography, specifically, cross-sectional metallography. Such metallography will identify the following key pieces of information:

a) Is the base metal corroding in an accelerated fashion? The purpose of the Galvalume coating by design is to corrode preferentially as it protects the underlying steel substrate. There may even be occasional minute areas where the corrosion has proceeded through a section of the coating "overlay" to the intermetallic alloy layer. This is not unusual for a roof of this age (35-39 years) under quite normal weathering circumstances.

b) Is the iron oxide formation only associated with the presence of hail divots? The Element report states there is iron oxide even on areas of the coating not associated with hail divots. Thus, other issues may be at play. For example, the Galvalume coating may be thinner than ASTM A792 requires, thereby leading to premature corrosion which would have been present for years preceding the hail event of March 16, 2023. Another real possibility is that the iron oxides on the roof are caused by airborne particulate deposition associated with the presence of the Cleburne airport 0.56 miles away. It is well known that aircraft jet engines emit solid soot particles[5]. These particles contain carbon which may lead to galvanic corrosion of the Galvalume coating[6], (recall that the Galvalume coating is approximately 80% aluminum, by volume).

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[5] Intergovernmental Panel on Climate Change, "Aviation and the Global Atmosphere", https://archive.ipcc.ch/ipccreports/sres/aviation/index.php?idp=35.

[6] Steelscape, a BlueScope Steel Company, "Zincalume® Steel Technical Bulletin #3 Fastener Selection for Zincalume® Steel Roof and Siding Products", July 1, 2012.

2) ***Regarding opinions 4 and 5, we believe the claimed presence of microcracks in the coating as highlighted in Figure 7a is the main reason for these opinions. However, the size of these supposed microcracks must be known before such opinions can be considered credible. That is, are the microcracks of significant size (width) to be judged detrimental to the coating's ability to offer corrosion resistance or to have adversely impacted the roof's service life? Based on the following they are not:***

   a) ***Using photo 7a, shown below in Figure 2, the widths of the microcracks were measured based on the scale shown at the bottom of the photo. The eight microcracks range in size from 0.008-0.033 mm, with an average of about 0.015 mm.***

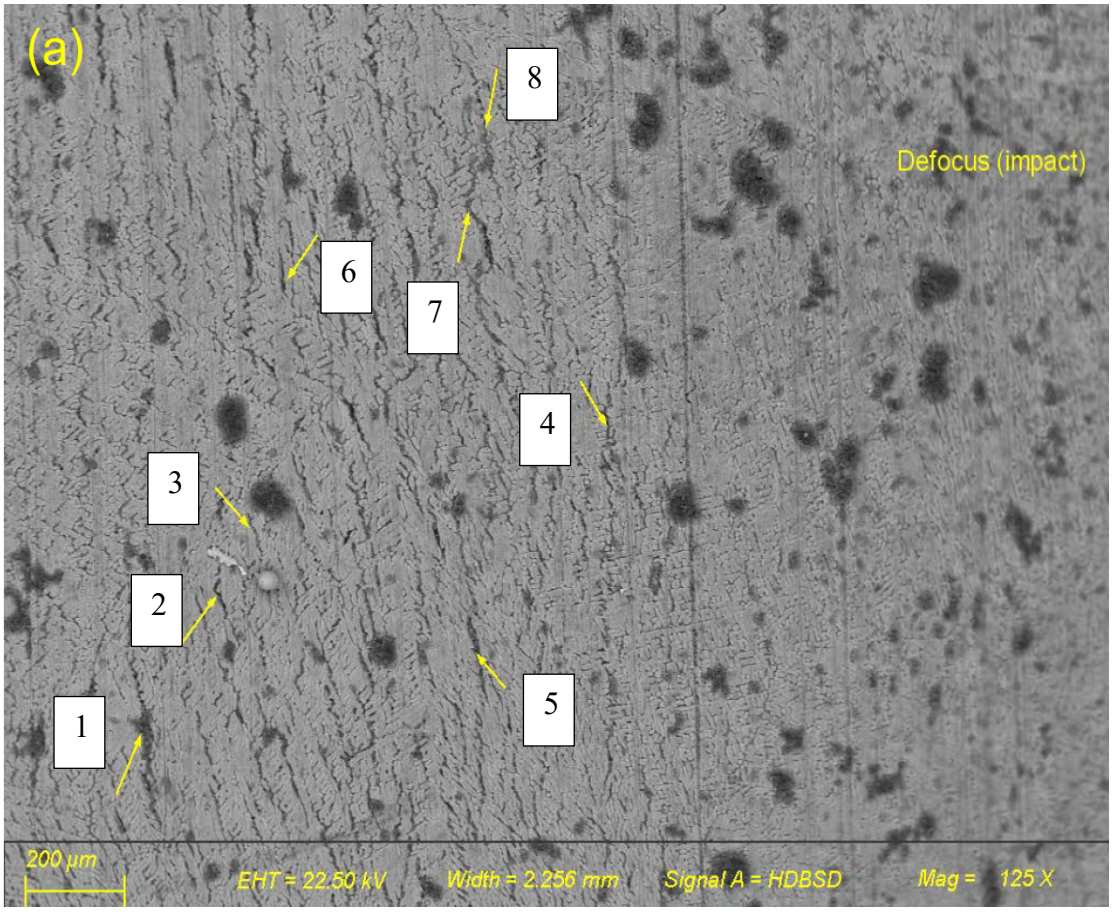

Figure 2. Figure 7a from the Element report used to measure crack widths.

To put this degree of microcracking into context, the photo in Figure 3 shows a roof panel profile rib radius on a roof in Denver, CO. While there are rust stains in the microcracks, they have not progressed over time or negatively impacted the continuing corrosion resistance of the Galvalume coating. Nor have they been detrimental to the roof's service life since the roof has been functioning without issue for 44 years (roof installed in 1977, photo taken in 2021).

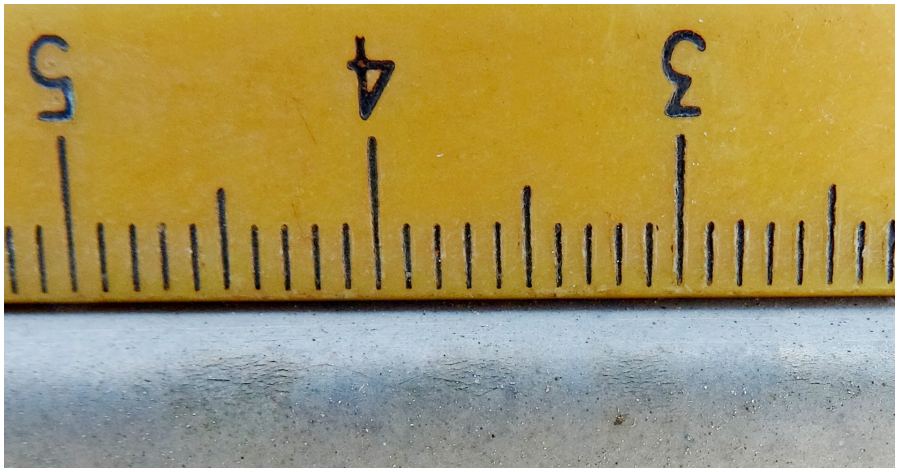

Figure 3. Denver roof profile rib radius showing microcracks; roof in service 44 years (scale in mm).

A cross-sectional micrograph of this profile rib radius at 75X magnification is shown in Figure 4, below. Note the presence of micro-cracks on the upper coating surface attributable to the normal "trauma" associated with roll forming the flat coil into a roofing panel.

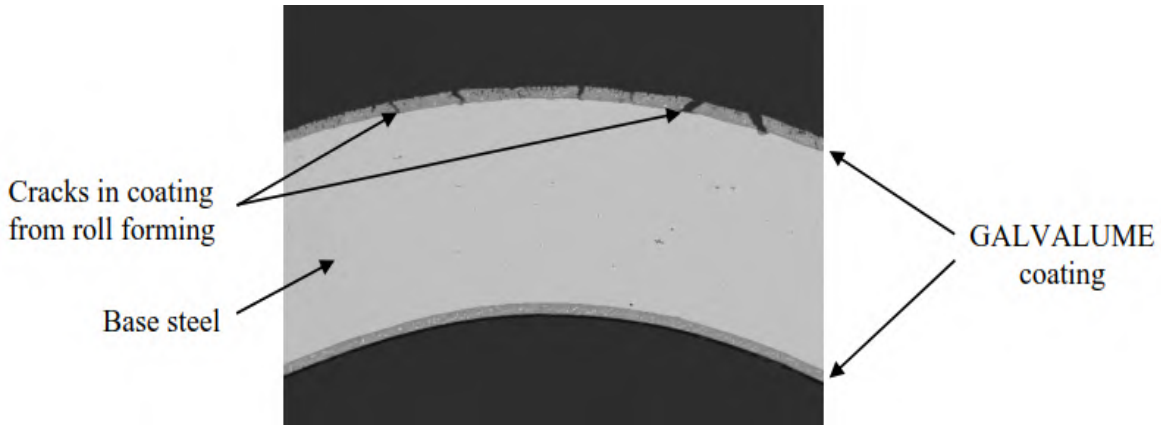

Figure 4. Metallographic cross-section of Denver profile rib radius at 75X magnification.

b) ***The widths of the microcracks from the Denver roof and the Cleburne roof sample 1A are plotted together for comparison in Figure 5, below. Note that the sizes of microcracks on the Cleburne roof are smaller than those on the Denver roof which continues to exhibit excellent performance after 44 years. Thus opinions 4 and 5 expressed in the Element report are not supported by the facts of empirical data.***

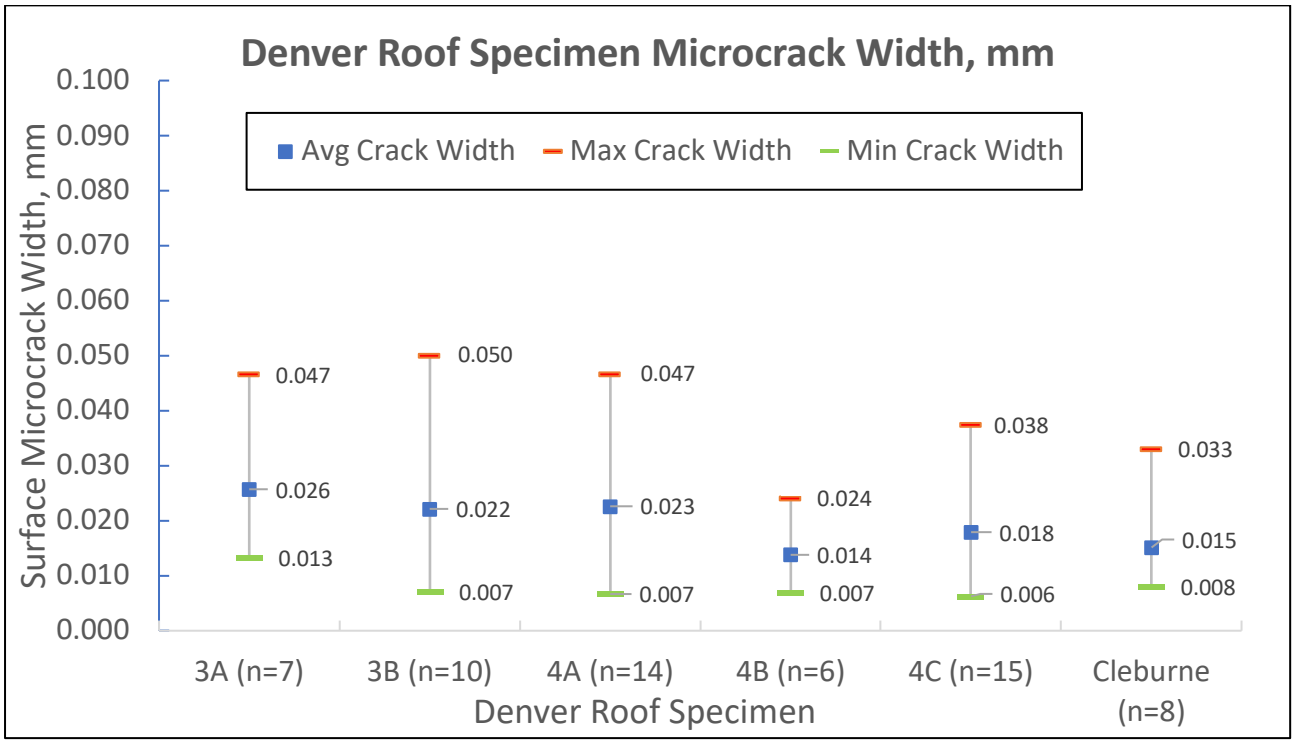

Figure 5. Galvalume coating microcrack widths observed on the Denver roof compared to those on the Cleburne roof.

ROOF PANEL SAMPLES ANALYSES BY DUTTON

Roof samples were received from Element Materials Technology on September 24, 2024. The samples included five larger panel pieces, and four smaller specimens cut from three of the larger pieces, as shown in **Figure 6**. As they were the basis for the Element report, it is assumed they are representative of the "damage" done to the roofs as a result of the March 16, 2023 hailstorm. It is unclear from the report which of the several buildings at the Cleburne site served as the source for these samples.

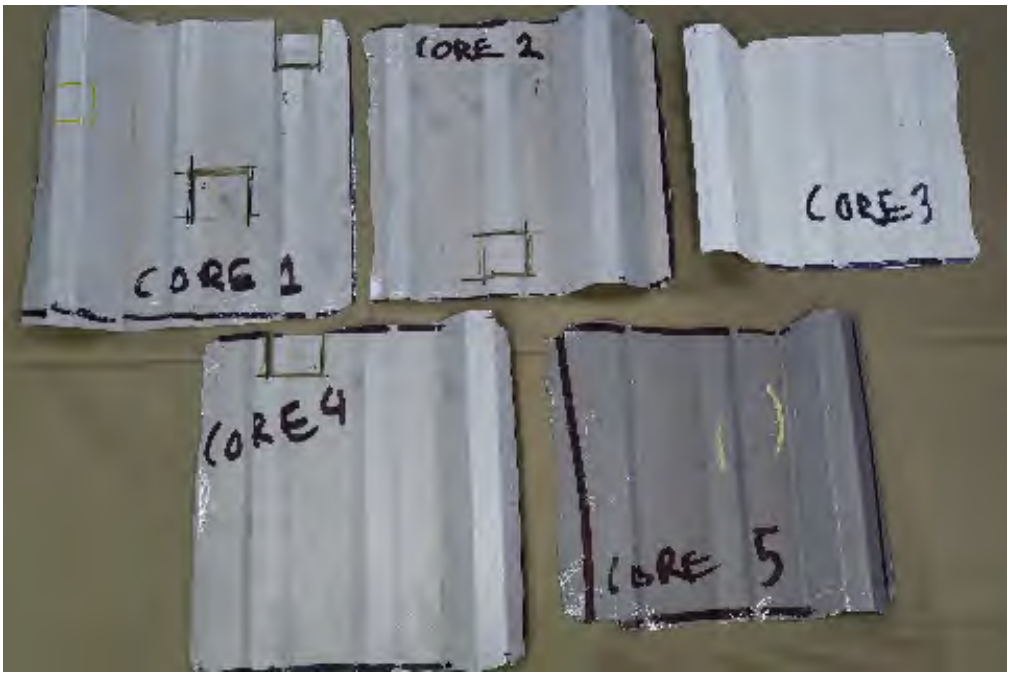

Figure 6. Roof panel samples representative of damage from the March 16, 2023 hailstorm.

Seven divots from these samples were available for analysis. Measurements were made of the depth and width of each divot. The measurements are shown in Table 1.

Table 1. Cleburne Samples Divot Measurements

Cleburne Divot Identity	Divot Depth, in.	Divot Width, in.
1A	0.039	0.280
1B	0.058	0.670
2	0.038	0.690
4	0.015	0.390
Core 1	0.026	0.770
Core 3	0.027	0.590
Core 5	0.009	0.590

These data can be compared with published data which correlates divot size with the impact energies associated with the hail diameters that produce such divots[7]. The Cleburne divot data are plotted on one of the figures from that published paper in **Figure 7**. The Cleburne data can be seen to fall primarily in the range of impact energies representing a hail diameter of 1", and not the 2-2.5" claimed in the Spradling and HailTrace reports.

[7] Dutton, R. and Haddock, R., "New Research on Hail Damage to 55% Al-Zn Alloy-Coated Steel Roofing", *Roofing Research and Standards Development: 10th Volume*, ed. S.Molleti and W.J. Rossiter (West Conshohocken, PA: ASTM International, 2023, pp. 174-199.

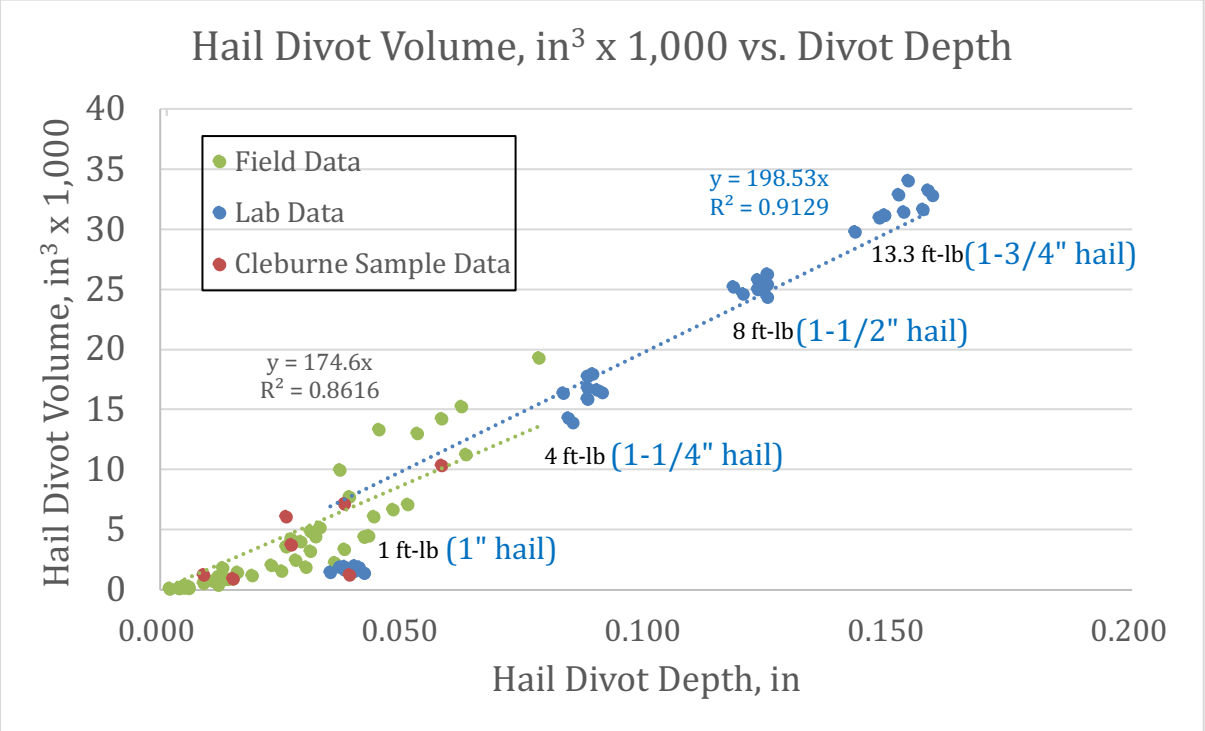

Figure 7. Divot depth vs. divot volume and correlation with hail impact energies and corresponding hail diameters[7].

CLEBURNE JOBSITE PHOTOGRAPHS REVIEWED BY DUTTON

Aged vs. Recent Divots:

641 jobsite photographs, taken on September 17, 2024 by a Thompson Coe representative, were received from Thompson Coe on September 24, 2024. A visual review of these photos shows that about 45% (21 of 47) of the divots captured in close-up photos are aged due to the dark accumulation of dirt and debris in the divots, while the remaining 55% (26 of 47) are more recent. The representative photographic montage in **Figure 8** shows these visual differences. Based on our forensic investigative experience (see pp. 2-3 of this report), our opinion is that the aged divots were produced by a hail event prior to March 16, 2023.

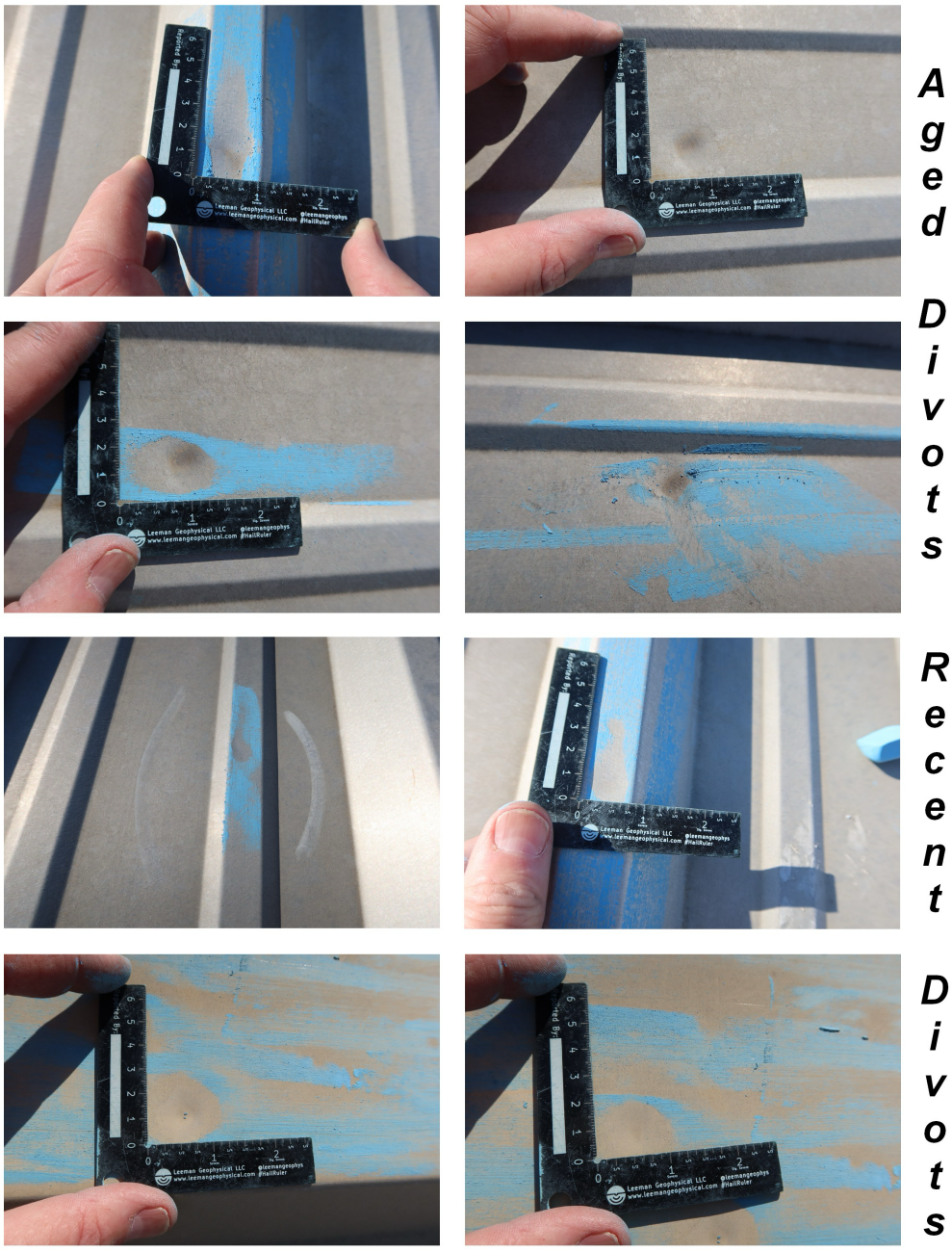

Figure 8. Visual appearance of aged divots (top four photos) compared to that of more recent divots (bottom four photos) based on jobsite photographs.

Maintenance/Installation Issues:

Another other major issue revealed by the jobsite photographs is the significant amount of effort that has been expended to apply sealant to remedy roof leaks in the past and which have nothing to do with hail strikes. Examples are shown in the figures below.

Many areas of the roofs have apparently leaked for years as evidenced by the application of sealant to endlaps, fasteners, and flashings and significant aging of those remedies as seen in **Figure 9**.

Multiple Areas of Attempted Leak Repairs

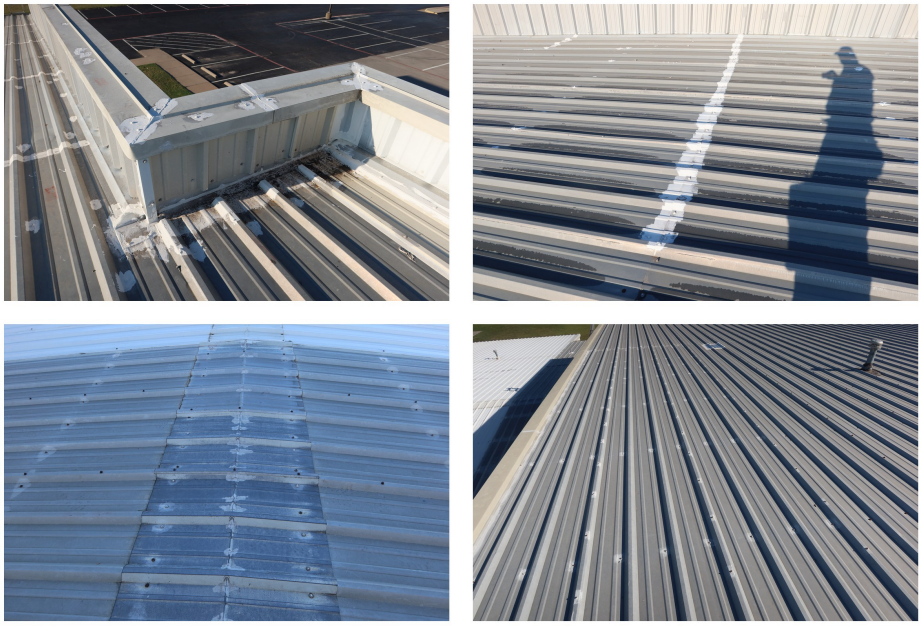

Figure 9. Several examples of roof areas where sealant has been applied in attempts to stop leaks.

Roof penetrations have also been the source of leaks in the past as evidenced by the many areas shown in **Figure 10**.

Roof Penetrations Heavily Corroded and Patched to Stop Leaks

Figure 10. Roof penetrations exhibiting significant corrosion and evidence of leaking.

One particular area exampling problems that have been ongoing for many years is shown in **Figure 11**. This is an example of inside/out corrosion which occurs when underlying insulation becomes wet. Corrosion through the panel occurs due to the moisture and general lack of oxygen underneath the panel. The panel in this case has been corroded completely through and will allow water intrusion every time it rains.

Figure 11. Inside/out corrosion leading to perforation of the roof panel and subsequent leaks.

Significant deformations on some profile ribs, such as shown in **Figure 12**, are known as rib crippling caused either by improper installation practices when trafficking the roof during construction, or improper foot traffic on the installed roof during maintenance. They are not to be confused as evidence of hail strikes.

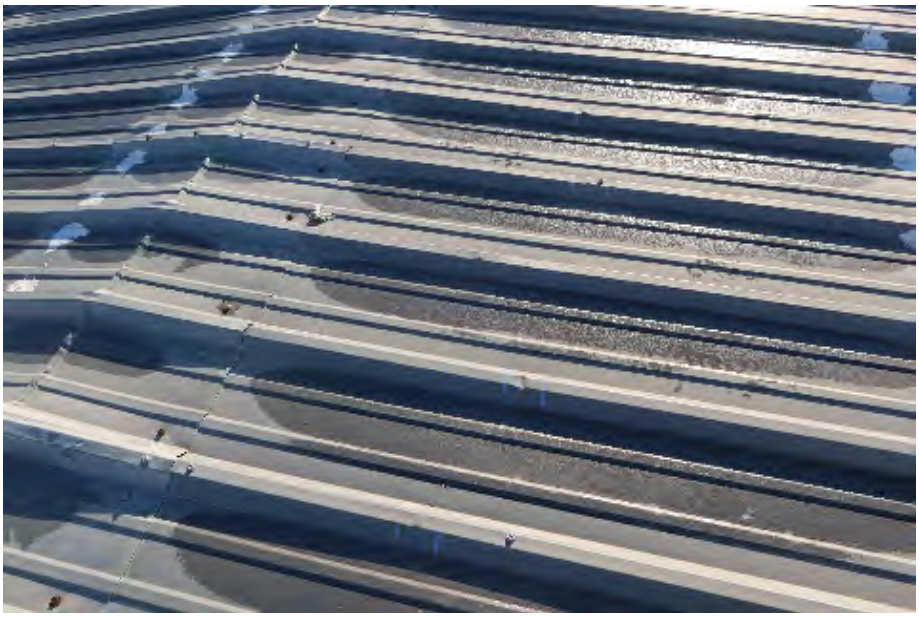

Figure 12. Evidence of rib crippling from installation or maintenance issues.

CONCLUDING COMMENTARY

1. A hailstorm struck the Cleburne Training and Fitness Center complex on March 16, 2023 with hailstone diameters said to be possibly up to 2.0, or 2.5", depending on which forensic weather report is consulted. None are conclusive with respect to hail sizes at the project site.
2. The Spradling Report provides visual evidence of hail impacts on roofs in the Cleburne Training and Fitness Center complex, although no mention is made regarding which of the impacts are "fresh" and attributable to the March 16, 2023 hailstorm vs. previous hailstorms in 2013 and 2017 where hailstone diameters up to 1.5-1.75" were observed.
3. The Spradling Report that claims water intrusion after the storm lacks evidence to show a causative relationship with specific hail damage. Claims of repairs made to the roofs after the storm are not documented to show where such repairs were made and if they were associated with fresh hail strikes.
4. Iron oxides in hail divots and on the undented surfaces of the Galvalume coatings are not evidence that the corrosion resistance of the coating has been compromised by hail but rather may be associated with either low coating weights or the nearby Cleburne airport where jet engine exhaust may be depositing carbonaceous material which is known to accelerate corrosion of the Galvalume coating.
5. Without cross-sectional metallography it is not possible to determine conclusively whether there are microcracks or to evaluate the impact of such coating microcracks. However, assuming for the moment that these are microcracks, the sizes of these microcracks on the Cleburne roofs are not significant. They are less severe when compared with microcracks associated with the normal trauma of panel roll forming as evidenced by the roof panels on a Denver Galvalume roof which has exhibited excellent corrosion resistance for 44 years.
6. Based on a review of the same panel samples used in the Element report, the divot measurements of depth and width align with published data that correlates with impacts from hail of approximately 1 inch.
7. Based on a review of 641 jobsite photographs procured by Thompson Coe, about half of the divots observed on the roofs pre-date the March 16, 2023 hailstorm. Both aged and recent hail divots appear to be minor with no indication of coating crazing due to hail strikes.
8. Based on a review of the same 641 photographs, major maintenance/installation issues have plagued these roofs for years and are the cause of any leaks that may be present.
9. We have never seen functional damage to this material and panel type(s) caused by hail strikes of similar size and intensity as those described here.
10. Based on all the above commentary, it is our opinion that the information presented in the five expert reports we have reviewed have not conclusively demonstrated that the impact of hail from the March 16, 2023 hailstorm has diminished the performance, service life, or value of the subject roofs from a functional perspective. This opinion is further supported by our physical analysis of the roof samples and a review of jobsite photographs.

CONSULTANT QUALIFICATIONS AND DISCLAIMERS

Mr. Haddock has been involved in the metal construction industry for 53 years; Mr. Dutton for 41 years. Haddock has installed or supervised the installation or inspected 10's of millions of square feet of unpainted Galvalume roofs and inspected at least 3 million square feet of roofs on at least 50

buildings involving hail events. Dutton and Haddock have recently directed an industry-wide project involving field inspection of aged roofs and directed protocols for their evaluation. All were Galvalume®. BIEC (the licensing authority for 55% Al-Zn coating technology worldwide) is or has been a consulting client of both Haddock and Dutton. They have spent hundreds of hours professionally with engineers and metallurgists who developed the Galvalume® coating, including its inventors and including evaluation of its performance over decades of time. Further credentials are enumerated in the respective C.Vs. (previously forwarded).

We have stated the relevant facts and professional opinions concerning them herein with a reasonable degree of professional certainty and based upon our combined experience and technical knowledge gained over the last 53 years of contracting, consulting, technical research, and inspections of hundreds of projects and documents as of this date. We reserve the right to change or supplement these opinions based upon further findings and/or documentation by ourselves or others.

DOCUMENTS REFERENCED

The documents numbered 1 through 6 on the opening pages of this report have been distributed to us and formed the basis for our assessment of the claims for functional damage to the Cleburne Training and Fitness Center. Other references of publications are footnoted in this report for source material.

(End of Report)

Submitted by email or Dropbox on the day first above written.

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